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# The Impacts of Changes in the Value Added Tax Rate on the Economy in EU Countries

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### ABSTRACT

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*Any change related to value added tax is perceived very carefully and sensitively, as it is a tax instrument that can ensure a significant increase or decrease in tax revenues in individual countries. To get to the heart of the operation of VAT means to gain more knowledge about the processes in the economy as such. The paper deals with the impact of changes in the VAT rate on the economy in the 28 countries of the European Union using selected macroeconomic determinants, such as VAT revenue, gross domestic product, consumption expenditure, exports and imports, with individual EU countries considered as a separate territorial unit. The monitored period was from 2004 to 2018. The aim of the paper was to evaluate the impact on the economy when changing the standard VAT rate using annual increments from quantified partial econometric models using linear regression analysis. To achieve this goal, the correlation coefficient was used, which determined the relationships between selected macroeconomic determinants and the VAT rate in the EU countries. The analysis showed that an increase in the standard VAT rate by 1 % will cause a decrease in annual increments compared to the real values of annual increments for selected macroeconomic determinants. Ultimately, this will have a negative impact on the economy in the short term, as it will slow down their growth. The most significant slowdown by 2.51 % was achieved in imports and, conversely, the least significant slowdown in consumption expenditure by 1.11 %.*

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### INTRODUCTION

Value added tax (VAT) is the revenue of the state budget in most economies of the world. Their amount depends on several factors and reflects many needs of the state and its goals. It is in the center of attention of both natural and legal persons. Any change related to this tax will be reflected in the change in the economy. The contribution deals with the standard VAT rate, which must not be lower than 15 % in the EU Member States. (Baskaran et al., 2014).

VAT is often used as an instrument of fiscal policy, the aim of which is to influence the revenues and expenditures of the state budget in order to influence the purchasing power demand and thus change the level of GDP, consumer prices, but also employment. (Canova and Cicarelli, 2013). Fiscal policy has an expansionary character, with the government stimulating economic growth through instruments, e.g. by reducing tax rates, and thus wants to get the ball to start the economy. On the other hand, it is restrictive in nature, with the government using tools to dampen economic growth, e.g. by raising tax rates, resulting in a decline in GDP in the short term.

## 1. LITERATURE REVIEW

Thanks to the long development of optimal tax theory (Ramsey, 1927, Sandmo, 1976, Keen, 2007), the scientific literature provides various analyzes of tax systems, where the main subject of interest of many study authors is the impact of value added tax on the distribution of income or the consequences of the introduction of a uniform or variable rate (Sadka, 1977, Claus, 2013, Hajdúchová et al., 2015). Due to the change in the VAT rate on the economies of countries through changes in macroeconomic indicators, a smaller number of analyzes are devoted. Their authors, whose views are presented in this paper, have arrived at results that differ in some cases. According to Carroll (2010), the impact of a change in the VAT rate on economic growth in developing countries is crucial, as an increase in VAT will cause GDP to fall for several years. A significant impact of VAT on economic growth was observed in Nigeria (Umeora Chinweobo, 2013), which was determined using a linear regression model.

The situation was similar in Ethiopia from 2003 to 2012, where theoretical and empirical evidence revealed a positive impact of VAT on economic growth (Jalata, 2014). On the other hand, in EU countries, an individual analysis of five selected countries using the Bayesian approach showed a positive impact of the VAT rate on the GDP rate for Hungary, while for the remaining countries Bulgaria, the Czech Republic, Poland and Romania showed a slow negative impact of the VAT rate on economic growth. In Hungary, a reduction in the VAT rate would lead to economic growth. The study was also conducted in the form of panel data and a combination of the results of these two approaches found that in the long run an increase in the VAT rate will positively affect economic growth in all Central and Eastern European countries, while in the short term an increase in the VAT rate will reduce GDP (Simionnescu and Albu, 2016).

In 14 developed countries, including EU countries, panel data models of economic growth were used to identify trends as VAT rates changed. Miki (2011) found that before the VAT rate increased, economic growth increased. As soon as the VAT rate rises, GDP suddenly falls. Economic growth is gradually increasing after a dramatic decline. The topic of the VAT rate is becoming an instrument in the election campaign, which will also influence the further political direction of the country. The public is inclined to believe that an increase in VAT may slow economic growth and, conversely, their reduction is argued by a recovery in economic growth during a recession (Ibid.).

According to the IMF (2001), countries where VAT is introduced are less dependent on international trade and have higher levels of GDP per capita. Ramona et al. (2011) concluded that the decline in consumer consumption is influenced by an increase in the VAT rate, which ultimately has a negative impact on the economy as a whole. The same finding was made by Miki (2011), who states that the consumption of the population will decrease after the increase in the rate due to the previously announced increase in this rate, when consumers pre-supply themselves in advance. Later, after the introduction of the rate, consumption expenditure increases due to a decrease in stocks. Alm and El-Ganainy (2013) explain that consumption taxation will lead to increased economic growth, as it is expected to discourage the public from consuming and promote austerity. For this reason, it may be preferred to income tax.

In an effort to promote exports, many countries have decided to introduce VAT (Slemrod, 2011). In countries where the VAT rate is applied, an increase in VAT may lead to a loss of competitiveness, resulting in a decline in exports. Samimi et al. (2012) examined the relationship between exports and VAT. Based on the results, they pointed out that the presence of this VAT rate has a positive effect on exports. They call for the introduction of value added tax in countries where it has not yet been introduced. The change in the VAT rate also significantly affects unemployment in the country. This follows from a survey by Suster (2016), which found that with the difference of one to two quarters, unemployment tends to

develop in the same way as GDP. The aim of employment in relation to VAT is to support sound foreign economic policy. Economic freedom can also have a major impact on unemployment (Salama and Oláh, 2019).

The change in the real wage caused by the change in the VAT rate also affects the supply of labor. An increase in the VAT rate will reduce labor supply and, in addition, may lead to additional labor costs (Metcalf, 1995), where even a low pay system discourages employees from working in a country (Poór et al., 2020). Frederiksen et al. (1995) state that each country is characterized by the specifics that determine the impact of factors affecting employment when changes in the VAT rate. VAT revenue is determined by a number of factors, including the economic situation in the country, which is best characterized by gross domestic product. In addition, the higher the standard of living in a country in terms of GDP per capita, the higher the consumption, the better information on tax payments and the lower the tax fraud.

VAT revenue depends mainly on the level of consumption in the country. In addition, to the above factors, its income is also determined by the level of exports and imports. The export rate is zero, so export growth could have a negative impact on VAT. On the other hand, its growth mostly follows domestic production, which could be significant due to an increase in disposable income or household demand. The change in import VAT has the opposite effect on VAT revenue. The higher the import, the lower the demand for domestic goods, so an increase in imports leads to higher VAT revenues (Hybka, 2009).

The relationship between VAT revenue, VAT and macroeconomic indicators that characterize the economic situation in the country is analyzed: gross domestic product, gross domestic product per capita, consumer costs, household consumer costs, government consumer costs, exports, imports and unemployment (Legeida and Sologoub, 2003).

## 2. MATERIAL AND METHODS

The aim of the paper was to empirically verify the impact of changes in the standard VAT rate using annual increments of selected macroeconomic determinants on the economies of EU countries. This impact was quantified using partial econometric models using linear regression analysis. All source data used in the paper were annual data for 28 EU countries in the period from 2004 to 2018. Data on standard VAT rates, VAT revenues and selected macroeconomic determinants (gross domestic product, gross domestic product per capita, consumption and household expenditure, expenditure for government consumption, exports, imports and unemployment), which are expressed in EUR million, were used from the databases of the European Commission's statistical office EUROSTAT and the European Commission's Directorate-General AMECO.

The basis for the selection of indicators was the theoretical knowledge of the authors: Legeida and Sologoub (2003), Ramona et al. (2011), Miki (2011), Alm and El-Ganainy (2013), Jalata (2014), Simionescu and Albu (2016), Sustera (2016), which observed a large number of determinants influencing the change in the standard VAT rate. To determine the estimate of how the selected determinants affect the standard VAT rate, a *Pearson correlation coefficient* was chosen, which determined the amount of dependence between them. Interpretation of correlation coefficients was used according to Ode (2012): correlation + - 0.1 - 0.29 small / practically none, + - 0.3 - 0.69 slightly tight, + - 0.7 - 0.89 medium tight and + - 0.9 - 0.99 very tight.

Within the *linear regression analysis*, an econometric model was compiled, in which selected macroeconomic determinants were inserted on the basis of the correlation coefficient. The values used in the model were the arithmetic average of all 28 EU countries for the observed period from 2004 to 2018 and assuming that it was considered a separate territorial unit. The analysis of the econometric model using regression analysis was performed in the R program, specifically in the R 3.5.0 program version, called R Studio. The commands in the R programming language were used to compile and calculate the equations. The regression analysis determined which of the selected macroeconomic determinants are statistically significant in relation to the dependent variable.

Based on a linearly formulated model with several variables, the econometric model was constructed:

$$\text{VAT}_t = \beta_0 + \beta_1 * \text{GDP}_t + \beta_2 * \text{CE}_t + \beta_3 * \text{E}_t + \beta_4 * \text{I}_t + \beta_5 * \text{RfVAT}_t + u_t,$$

where the explained (dependent) variable is:

VAT – standard rate of value added tax, and the explanatory (independent) variables are:

GDP – gross domestic product,

CE – consumption expenditure,

E – export,

I – import,

RfVAT – revenue from standard value added tax.

After estimating the parameter vector  $\beta = (\beta_0, \dots, \beta_5)$  a model was created:

$$y_t = 17,37 - 9,197e-05x_1 + 8,520e-05x_2 + 6,309e-05x_3 - 6,836e-05x_4 + 4,951e-04x_5 + u$$

The linear model showed the correct results in the regression analysis because it met certain assumptions, namely: normality of residues (according to the Shapir-Wilk test, where residues are from the normal distribution if the p-value is greater than the significance level  $\alpha = 0.05$ ), heteroskedasticity (according to the Breusch-Pagan test, where heteroskedasticity is not present, i.e. homoskedasticity is present if the p-value is greater than the significance level  $\alpha = 0.05$ ), autocorrelation (according to the Breusch-Gofrey test, autocorrelation is not present if p-value is greater than the significance level  $\alpha = 0.05$ ), and multicollinearity (according to the Farrar-Glauber test, multicollinearity is not present if the p-value is greater than the significance level  $\alpha = 0.05$ ). Appropriate selection of the model indicates the estimation of regression coefficients, where the p-value is lower than  $\alpha = 0.05$ , and is therefore statistically significant. Furthermore, the coefficient of determination, which determines how many % of the variability of the dependent variable can be explained by the model (Zelinsky et al. 2010).

Using *sub-models*, the change in selected determinants due to a change in the standard VAT rate of 1 percentage point was calculated. The explained (dependent) variable in the sub-models were individual selected determinants, namely: gross domestic product, consumption expenditures, exports, imports, income from standard value added tax. The explanatory (independent) variable in each model was the standard VAT rate.

Subsequently, the impact on the economy through *annual increments* was determined, namely macroeconomic determinants with an increase in the standard VAT rate and their comparison with real values, which were calculated using the formula:  $\frac{(t_1 - t_0)}{t_0}$ .

## 3. RESULTS AND DISCUSSION

### 3.1 Correlation coefficient

The relationship and the amount of dependence according to the correlation coefficient between the factors is calculated and summarized in the table (Tab. 1). The color-coded sections in the table show statistically significant values according to the p-value.

Taking into account the EU as a separate unit, the indicators in the table (Tab. 1) represent a medium strong relationship, which means medium tight correlation (correlation coefficient 0.81 and 0.88). The relationship between the indicators standard VAT rate and unemployment represents a slightly tight positive correlation, but according to the p-value is statistically insignificant. All indicators are expressed by plus values, which shows a positive correlation and thus the increase in the indicator of the independent variable (macroeconomic determinants) leads to the increase in the dependent variable (standard VAT rate). Finland has the strongest relationship with a correlation coefficient of 0.93 for VAT and consumption expenditure and a coefficient of 0.92 for household and government consumption. A medium strong relationship, The Czech Republic, Finland, France, Lithuania and Slovakia achieved

a medium tight correlation (coefficient 0.70 - 0.89) for all indicators of the country. If we look at achieving a medium tight correlation according to the indicators, we see that it is reached by 10 countries in GDP, GDP per capita and consumption expenditure by 8 countries, household consumption expenditure by 9 countries, government consumption expenditure by 7 countries, exports by 18 countries and imports 12 countries.

**Table 1.** Correlation coefficient of dependence between the VAT rate and selected determinants in the EU

Country	Revenue from VAT	GDP	GDP per capita	Consumption expenditure	Household consumption expenditure	Government consumption expenditure	Export	Import	Unemployment rate
Austria	NA	NA	NA	NA	NA	NA	NA	NA	NA
Belgium	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bulgaria	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyprus	0,43	0,39	-0,05	0,38	0,48	-0,05	0,88	0,71	0,85
Czech Republic	0,85	0,75	0,74	0,75	0,75	0,72	0,89	0,88	-0,53
Germany	0,78	0,62	0,66	0,62	0,63	0,62	0,66	0,67	-0,81
Denmark	NA	NA	NA	NA	NA	NA	NA	NA	NA
Estonia	0,64	0,65	0,66	0,67	0,63	0,74	0,75	0,64	0,34
Greece	-0,17	-0,64	-0,64	-0,46	-0,45	-0,49	0,74	-0,37	0,84
Spain	0,71	0,50	0,38	0,59	0,60	0,52	0,90	0,53	0,70
Finland	0,93	0,86	0,83	0,93	0,92	0,92	0,41	0,70	0,46
France	0,83	0,78	0,75	0,75	0,74	0,75	0,82	0,77	0,51
Croatia	0,71	0,53	0,59	0,57	0,53	0,66	0,76	0,44	0,46
Hungary	0,63	0,36	0,40	0,21	0,22	0,20	0,43	0,33	-0,09
Ireland	0,01	0,65	0,58	0,45	0,47	0,37	0,75	0,74	0,24
Italy	0,73	0,70	0,57	0,66	0,71	0,41	0,84	0,52	0,89
Lithuania	0,71	0,74	0,77	0,72	0,71	0,72	0,85	0,78	0,44
Luxembourg	0,59	0,80	0,74	0,77	0,79	0,75	0,83	0,83	0,66
Latvia	0,41	0,48	0,55	0,49	0,51	0,43	0,72	0,53	0,55
Malta	NA	NA	NA	NA	NA	NA	NA	NA	NA
Netherlands	0,71	0,75	0,71	0,74	0,78	0,67	0,83	0,82	0,47
Poland	0,69	0,81	0,80	0,80	0,80	0,77	0,84	0,81	-0,54
Portugal	0,71	0,52	0,56	0,45	0,57	-0,35	0,82	0,58	0,53
Romania	0,45	0,13	0,14	0,04	0,07	-0,05	0,28	0,17	0,38
Sweden	NA	NA	NA	NA	NA	NA	NA	NA	NA
Slovenia	0,74	0,70	0,69	0,61	0,63	0,56	0,79	0,71	0,23
Slovakia	0,78	0,80	0,80	0,77	0,76	0,77	0,87	0,85	-0,38
United Kingdom	0,83	0,64	0,51	0,65	0,65	0,61	0,81	0,78	-0,06
<b>EU average</b>	<b>0,85</b>	<b>0,83</b>	<b>0,81</b>	<b>0,88</b>	<b>0,86</b>	<b>0,81</b>	<b>0,87</b>	<b>0,84</b>	<b>0,46</b>

Source: EUROSTAT own processing

On the contrary, the weakest and, according to the p-value, insignificant relationship was achieved in 12 countries with the unemployment rate indicator. In the independent evaluation of countries, we see an insignificant relationship in the case of Cyprus in terms of indicators such as VAT revenue, GDP, GDP per capita, household expenditure, household and government consumption. In Romania, insignificant values were published for all indicators, as well as in Hungary with the exception of VAT revenue.

Greece has a negative relationship with GDP and GDP per capita.

The zero correlation coefficient and thus no correlation is expressed by the relationship between the indicators standard VAT rate and VAT revenue in the countries of Austria, Belgium, Bulgaria, Denmark, Malta and Sweden. The reason for this situation is the constant VAT rate in these countries. The countries of Cyprus, Greece, Ireland, Latvia and Portugal achieved an insignificant value of the p-value correlation. The remaining countries were positively correlated. 12 countries show a medium tight correlation with a coefficient of 0.70 - 0.89 and a very tight correlation with a value of 0.93 is Finland. The EU, as a separate territorial unit, achieved a correlation coefficient of 0.85, which is a medium tight correlation.

Based on the calculated coefficients, selected macroeconomic determinants were selected in the econometric model determining the standard VAT rate, namely GDP, general consumption expenditure, exports, imports and VAT revenue.

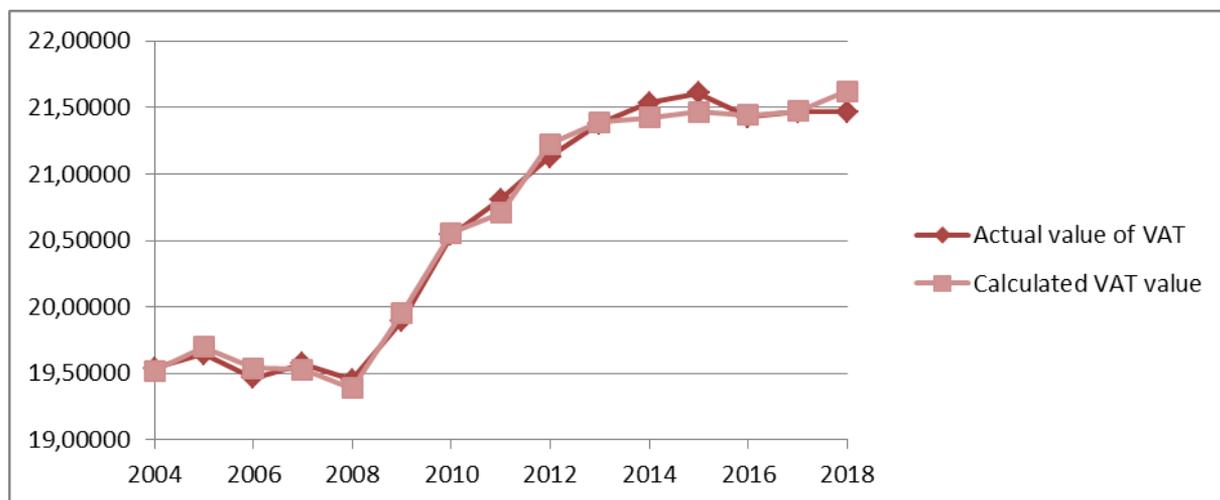
### 3.2 Regression Analysis

An constructed model of linear regression, which expresses the relationship between the rate of the standard VAT rate and the vector of regressors, selected macroeconomic determinants, showed that the coefficient  $\beta_0 = 17.37$  is an estimate of the level constant and expresses that if all variables in the model were equal to zero, then the level of the VAT rate would be 17.37 %. Other values in the model are estimates of regression coefficients  $\beta_1$ ,  $\beta_2$ ,  $\beta_3$ ,  $\beta_4$  and  $\beta_5$ , which say that if the variable in the model ( $x_1$ , ...,  $x_5$ ) changes by one unit of measure, the value dependent by such a part of the unit of measure changes, which is the estimated regression coefficient. From the estimated coefficients, it was concluded that the biggest influence on the change in the rate has the income from VAT and with its increase by 1 mil. EUR will cause an increase in the VAT rate by  $4.951e-04$  %. With an increase in consumption expenditure by 1 mil. EUR, there would be an increase in the VAT rate by  $8.520e-05$  % and with an increase in exports by 1 mil. EUR, the VAT rate would increase by  $6.09e-05$  %. On the contrary, with GDP, its increase by 1 mil. EUR caused a decrease in the rate by  $9.197e-05$  and an increase of 1 mil. EUR, the import rate would fall by  $6.839e-05$ .

By testing the normality of the residues using the Shapes-Wilk test, a p-value of  $0.9764 > 0.05$  was obtained and the residues are from the normal distribution. By testing heteroskedasticity using the Breusch-Pagan test, a p-value of  $0.4921 > 0.05$  was obtained, indicating that the data are not heteroskedastic. An autocorrelation was tested with the Breusch-Godfrey test, where a p-value of  $0.8415 > 0.05$  and the model was considered suitable.

Testing the model as a whole using F-statistics yielded a p-value of  $4.846945e-9 < 0.05$ , which is the basis for the assumption that at least one regression coefficient is non-zero and thus significant. By testing the significance of the estimated regression coefficients, the p-value was obtained for all regressors  $< 0.05$  and thus all are statistically significant. Lastly, the quality of the model adjustment was evaluated according to the value of the coefficient of determination, which was 0.9915314, which indicates that approximately 99.15 % of the total variability of the dependent variable, i. standard VAT rate is explained by the chosen model and the remaining variability is caused by the element of chance and other factors.

To determine the relationship of the standard VAT rate to selected macroeconomic determinants, it would be possible to use all five selected variables, which explained 99.15 % of its variability. The following graph shows how the constructed model corresponds to the development of the actual amount of the standard VAT rate and calculated (Figure 1).



**Figure 1. Actual and calculated values of the standard VAT rate for the period 2004-2018**

Source: own processing

Based on all macroeconomic determinants from the compiled model, the values of the standard VAT rate were calculated, which with slight deviations faithfully copy the actual value of the VAT rate. Based on the tested model, from a theoretical point of view, it can be said that the given variables, selected determinants, could describe and determine the level of the standard VAT rate.

To prove how the selected macroeconomic determinants would evolve when changing the standard VAT rate, simple partial models of linear regression were created with one dependent - selected determinants and with one variable - the standard VAT rate.

In all sub-models, the residues were from the normal distribution. The data are not heteroskedastic and no autocorrelation is present. In some models, the presence of multicollinearity occurred, which was ignored.

**Table 2. Overview of the results of regression analyzes**

	1. model GDP ~ VAT	2. model CE ~ VAT	3. model E ~ VAT	4. model I ~ VAT	5. model RfVAT ~ VAT
Intercept $\beta_0$	-471912	-339810	-581425	-450306	-52003,7
Parameter estimation $\beta$	46248	34472	37747	30906	4118,8
Estimation of standard deviation - intercept	173830	108775	120944	113824	14318,3
Standard deviation estimation - parameter $\beta$	8433	5277	5867	5522	694,6
Estimation of standard deviation for model	28200	17650	19620	18470	2323
p-value - intercept	0,0176880	0,0080700	0,0003420	0,0016400	0,0030400
p-value - parameter $\beta$	0,0001050	0,0000190	0,0000222	0,0000867	0,0000499
p-value for the model	0,0001050	0,0000190	0,0000222	0,0000867	0,0000499
Coefficient of determination	0,6982	0,7665	0,761	0,7067	0,7301
Corrected coefficient of determination	0,675	0,7485	0,742	0,6842	0,7093

Source: own processing

Based on the compiled partial regression models, the vector of parameters  $\beta = (\beta_0 \text{ and } \beta_1)$  was estimated in each model. It is clear from the table that in the 1st model the coefficient Intercept  $\beta_0 = -471\,912$  is an estimate of the level constant, and it tells us that if it were a variable, which means that our VAT is equal to zero, the amount of GDP would be - 471 912 mil. EUR. The second value is an estimate of the regression coefficient  $\beta_1$ , where an increase in VAT by 1 % would mean an increase in GDP by 46,248 mil. EUR. In the 2nd model, the coefficient  $\beta_0$  describing consumption expenditures would reach the amount at the variable equal to zero - 339 810 mil. In the event of a 1 % increase in VAT, consumption expenditure would increase by 34,472 million. EUR. In the 3rd model, with VAT equal to zero, the amount of exports would be -581,425 mil. EUR and with a 1 % increase in VAT, exports would increase by 37,747 mil. EUR. In the 4th model, with VAT equal to zero, the value of imports would reach -450,306 mil. EUR and a VAT increase of 1 % would increase imports by 30,906 mil. EUR. The last 5th model would reach a revenue from VAT at zero VAT rate - 52 003.7 mil. EUR and a VAT increase of 1 % would increase VAT revenue by 4,118.8 mil. EUR.

By testing the significance of the estimated regression coefficients, a statement was made based on the p-value that was for the explained variable, which means VAT lower than the significance level  $\alpha = 0.05$ , that is statistically significant in all sub-models. The table shows that the p-values for the parameter  $\beta$  and the model as a whole are the same due to the use of one explanatory variable in the model. Likewise, the p-values in each of the models are statistically significant.

By evaluating the alignment quality of each model according to the value of the coefficient of determination, it can be seen that the highest value of the coefficient of determination was reached by the 2nd model, which indicates that approximately 76.65 % of the total variability of the dependent variable, consumption expenditure, are explained by the model chosen. The following is the 3rd model, which describes approximately 76.1 % of the total export variability. The lowest value was reached by the 1st model, which explains 69.82 % of the total GDP variability.

### 3.3 Annual Increments

Based on the calculated values of the estimated  $\beta$  parameters from simple sub-models and the subsequent calculation of the annual increments, the impact on the economy was determined by increasing the standard VAT rate by 1 %. It was found that for the observed period during the crisis (2008-2010), all selected determinants have a positive annual increase compared to real values when increasing the VAT rate by 1 %, which indicates a positive impact on the economy and in recent years have a negative impact. However, from a theoretical point of view, it is not appropriate to increase the VAT rate in times of crisis, because an expansionary policy is used to stimulate economic growth by reducing rates. There is a contradiction with the theory in these years of crisis. Given the crisis known so far, it took place like none before it and could have created a cycle that was very short, which could lead to a deviation that is not standard - so it was considered more appropriate to assess other years outside the crisis, where at the beginning of the period, strong growth can be seen and the use of a restrictive policy using an increase in the rate would dampen economic growth, which would result in a decline in the values of selected macroeconomic determinants and a subsequent negative impact on the economy in the short term.

**Table 3.** Average annual increments in % with an increase in the standard VAT rate of 1 %

	<i>Annual increment</i>	<i>Calculated increment when VAT increases by 1 %</i>	<i>Difference</i>
GDP	2,63 %	1,37 %	-1,26 %
Consumption expenditure	2,44 %	1,33 %	-1,11 %
Export	5,16 %	2,89 %	-2,27 %
Import	4,96 %	2,45 %	-2,51 %
Revenue from VAT	3,32 %	1,82 %	-1,50 %

Source: own processing

In the 1st model describing the *relationship between GDP and VAT indicators*, if the value of the VAT indicator were to increase by 1 %, this would mean an increase in GDP by 46,248 mil. EUR. Based on the calculated annual increases in real GDP and GDP affected by the 1 % increase in VAT, it was found that if the VAT rate increases at the time of expansion and the annual GDP increases are positive compared to the previous period, it would cause a further decline in GDP, which should have a negative impact on economic growth. By evaluating the whole period from the point of view of one whole and calculating the average annual increase in GDP, it was found that in the period when there was a 1 % increase in VAT, the annual increase was 1.37 % and in the real period it was 2.63 %. On this basis, it is considered that the increase in the VAT rate will ultimately have a negative impact on the economy, as it will slow down the GDP growth rate by 1.29 %. This result confirms the findings of Carroll et al. (2010) and Simionnescu and Albu (2016), who found that an increase in VAT would cause a decline in GDP for several years. Also according to Miki (2011), who argues that the public is inclined to believe that increasing VAT may slow economic growth.

In the 2nd model describing the *relationship between the indicators of consumption expenditure and VAT*, with an increase in VAT by 1 %, consumption expenditure would increase by 34,472 mil. EUR. As in the previous model, annual increases in real consumption expenditure were calculated and affected by a one percent increase in VAT. It was found that for the whole period under review, the average annual increase was lower due to the increase in VAT, namely 1.33 % compared to the period in which this increase in VAT did not occur, namely 2.44 %. The same view was reached by Ramona et al. (2011), who argued that the decline in consumer consumption is affected by an increase in the VAT rate, which ultimately has a negative impact on the economy as a whole.

The same result resulted in the indicators export and import, where in the 3rd model describing the *relationship between the indicators export and VAT*, with a 1 % increase in VAT, exports would increase by 37,747 mil. EUR. The annual increase for the whole period, when there was no change in the rate, represented an annual increase in real exports of 5.16 %. With an increase in the VAT rate by 1 %, it would reach 2.89 % for the whole period, which represents a decrease in the annual increase by 2.27 %. The findings of Slemrod (2011) confirm that in countries where the VAT rate is applied, it may lead to a loss of competitiveness as a result of its increase, as a result of which exports are declining.

In the 4th model describing the *relationship between the indicators import and VAT*, an increase in VAT by 1 % would result in an increase in imports by 30,906 mil. EUR. Taking into account the annual increments for the whole period, in the period in which the VAT rate changed, the annual increment would decrease by 2.51 % compared to the period without the increase in the VAT rate.

In the 5th model expressing the *relationship of VAT revenue to the standard VAT rate*, it was found on the basis of estimated parameters  $\beta$  that if the standard VAT rate is equal to zero, the amount of VAT revenue will reach -52,003.7 mil. This, based on this estimated amount, shows how significant part of the revenue to the state budget the EU would have lost as a separate territorial unit if it did not apply the standard VAT rate. On the other hand, an increase in VAT by 1 % would increase VAT revenue by 4,118.8 mil. EUR. This relationship confirms the above-mentioned positive correlation. However, when calculating the average annual increments for the reference period for real VAT revenues affected by the change in the VAT rate, it was found that for VAT revenues affected by a 1 % increase in the VAT rate, the annual average increase was 1.82 % compared to VAT revenues unaffected by the change rate that was 3.32 %. The difference between the values represents a 1.50 % decrease in the increase in VAT revenue due to the increase in the VAT rate. This decrease in VAT revenue is due to a decrease in the value of macroeconomic indicators influenced by the increase in the VAT rate, of which VAT revenue consists. A decrease in the increase in VAT revenue, which was affected by a 1 % increase in the VAT rate, would ultimately have a negative impact on the economy.

## CONCLUSION

An important task for the government is to set the standard VAT rate correctly, which will make it possible to create a sufficient financial reserve, especially in times of crisis, when government spending is rising. The change in the standard VAT rate is perceived very sensitively, as it can have a negative or

positive impact on the economy. In the analysis by means of a correlation coefficient, the existence of a positive dependence was found for all selected determinants. The results of the analysis show that the created partial models expressing the relationship of individual determinants to the VAT rate confirmed the positive dependence, especially when increasing the VAT rate. From the resulting values obtained from individual partial regression models, the average annual increments of selected macroeconomic determinants for the entire period were calculated. It was found that in the period when there was an increase in VAT by 1 %, the annual increase was smaller than in the real period, unaffected by the increase in the VAT rate, specifically in expenditure consumption was lower by 1.11 %, in GDP by 1.26 %, for VAT revenues by 1.50 %, for exports by 2.27 % and for imports by 2.51 %. The analysis concludes that an increase in the standard VAT rate of 1 % would have a negative impact on the individual macroeconomic determinants observed and thus on the EU economy as a separate territorial unit, as it would slow down their growth rate.

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